



**6712-01**

**FEDERAL COMMUNICATIONS COMMISSION**

**47 CFR Part 2, 5 and 15**

**[ET Docket No. 18-21, RM-11795, FCC 19-19]**

**Spectrum Horizons**

**AGENCY:** Federal Communications Commission.

**ACTION:** Final rule.

**SUMMARY:** In this document, the Commission took steps to provide new opportunities for innovators and experimenters to develop new equipment and applications for spectrum between 95 GHz and 3 THz, frequencies that only recently are becoming well-suited for the development and deployment of new active communications services and applications. The Commission adopts rules for a new class of experimental licenses available for the spectrum above 95 GHz that provide for increased flexibility. In addition, the Commission will make 21.2 gigahertz of spectrum in the 116-123 GHz band, the 174.8-182 GHz band, the 185-190 GHz band, and the 244-246 GHz bands for unlicensed use under rules with technical parameters similar to those currently in place for unlicensed operation in the 57-71 GHz band.

**DATES:** Effective **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**, except for §§ 5.59, 5.77, 5.121, 5.702, 5.703, 5.704, 5.705 and 15.258, which are delayed. We will publish a document in the Federal Register announcing the effective dates.

**ADDRESSES:** Federal Communications Commission, 445 12th Street, SW, Washington, DC 20554.

**FOR FURTHER INFORMATION CONTACT:** Mr. Brian Butler of the Office of Engineering and Technology, Policy and Rules Division, at (202) 418-2702, or [Brian.Butler@fcc.gov](mailto:Brian.Butler@fcc.gov).

**SUPPLEMENTARY INFORMATION:** This is a summary of the Commission's Report and Order, ET Docket No. 18-21, and RM-11795, FCC 19-19, adopted March 15, 2019 and released March 21, 2019. The full text of this document is available for public inspection and copying during normal business hours in the FCC Reference Center (Room CY-A257), 445 12<sup>th</sup> Street, SW, Washington, DC 20554, or by downloading the text from the Commission's web site at <https://www.fcc.gov/document/fcc-opens-spectrum-horizons-new-services-technologies-0>. Alternative formats are available for people with disabilities (Braille, large print, electronic files, audio format) by sending an email to [fcc504@fcc.gov](mailto:fcc504@fcc.gov) or calling the Commission's Consumer and Governmental Affairs Bureau at (202) 418-0530 (voice), (202) 418-0432 (TTY).

## **SYNOPSIS**

### **Spectrum Horizons Experimental Radio Licenses**

The Commission adopt rules for a new experimental radio license, the Spectrum Horizons Experimental Radio License (Spectrum Horizons License), that will be available for experiments and demonstrations of equipment designed to operate exclusively on any frequency above 95 GHz. The Spectrum Horizons License rules will incorporate the proposals that the Commission made in the Notice of Proposed Rulemaking (NPRM) in this proceeding (83 FR 13888). Specifically, the Spectrum Horizons License will differ from other experimental radio licenses by providing for, among other things, broad eligibility, a longer term, and additional flexibility to market devices. The Commission expects that, collectively, these Spectrum Horizons License features should promote a more rapid development of new products and services that will reach a larger number and wider variety of users than it would be possible under the existing experimental licensing rules.

1. *Available Frequencies.* Applicants for Spectrum Horizons Licenses may request authorization on any frequency within the 95 GHz to 3 THz frequency range. Given the unique characteristics of these bands, and concern that it could stifle innovation or limit an applicant

from developing new and novel methods for coexisting with existing services, the Commission choose not to, by rule, preclude the use of any specific frequencies. While the Commission will not require any specific compatibility analysis, it will require, as proposed, any application for a Spectrum Horizons License to include, as a prerequisite to grant, a narrative statement that sufficiently explains the proposed new technology/potential new service and an interference analysis.

2. All bands between 95 GHz and 275 GHz are allocated on a shared basis for federal and non-federal use. Above 275 GHz, while there are no allocations, a number of bands are identified for use by passive services in footnote US 565. Accordingly, Spectrum Horizons Licenses, will only be granted on a non-interfering basis (as is the case with all experimental radio licenses), only following coordination with federal users through the National Telecommunications and Information Administration (NTIA) and the Interdepartment Radio Advisory Committee (IRAC) process. Unless a sufficient methodology for preventing harmful interference is detailed, such operations will not be permitted. In this regard, the Commission also note that certain parameters of any experimental license applications will require to be disclosed publicly, including frequency(s), types of emissions, power, and location. Thus, interested Federal parties will have full information available to evaluate whether propose experimental licenses are compatible with existing federal operations.

3. Moreover, Spectrum Horizons License applicants that propose to use spectrum exclusively allocated for passive use(s), must provide an explanation why nearby bands with non-passive allocations are not appropriate or adequate for the experiment and acknowledge that they intend to transition any potential long-term use to a band with appropriate allocations. The Commission adopt this approach rather than prohibiting use of the passive bands because it does not want to unnecessarily hobble valuable research in situations that pose no significant risk to incumbent operations. The coordination of experimental use of the passive frequencies through

the IRAC process will provide an opportunity for dialogue between affected parties and applicants which in many cases will provide a path for coexistence with the passive services.

4. As with the passive bands, the Commission did not adopt a rule precluding experimental use of the bands allocated for amateur use or impose blanket special coordination procedures in such bands. Given that both the amateur radio service and the experimental licensing program are designed to contribute to the advancement of radio knowledge, the Commission see value in continuing to allow licensed operations under both parts 5 and 97 of its rules because doing so supports the objectives that are common to both rule parts

5. Finally, the rules provide that the Commission may, at any time without notice or hearing, modify or cancel a Spectrum Horizons License, if, in its discretion the need for such action arises. The Commission note that cancelling a license is an action of “last resort” and the Commission routinely works with parties to resolve potential or actual issues prior to issuing an experimental license or in rare instances of actual interference, by authorizing modifications that allow for interference-free operations.

6. *Eligibility.* The Commission will make Spectrum Horizons Licenses broadly available to persons qualified to conduct the types of operations described in existing experimental radio service rules. The Commission believe these same eligibility requirements will encourage widespread experimentation in the bands above 95 GHz while providing adequate safeguards that such experimenters have the knowledge necessary to ensure incumbent services are protected from harmful interference. TIA suggest that Spectrum Horizons License applicants be required to establish their eligibility for these licenses by including a description of their technical qualifications and prior experience in RF issues with their application unless they already meet the specific eligibility categories associated with an Experimental Program License. The Commission rejects this proposal as overly prescriptive for a band whose users and use models are still evolving. Thus, Spectrum Horizons License applicants’ qualifications will be

considered on a case-by-case basis as part of the general application process and the Commission will seek any additional information as necessary.

7. *License Term and Interim Reporting Requirements.* The Commission adopt its proposal to authorize Spectrum Horizons Licenses for the longest license term—ten years—of any experimental license to encourage entrepreneurs to invest in this largely untested spectrum and yield more useful long-term information and data in support of subsequent rulemaking activity or waiver requests for operations in these bands. The Commission believes that a single ten-year grant issued under the conditions outlined above, as opposed to a five-year grant with an expectation of renewal, is less burdensome and more efficient for both the licensees and the Commission staff. The Commission will not provide for the renewal of a Spectrum Horizons License, as it determines the ten years is sufficient time to determine whether the experimental operations warrant the authorization of more permanent use through either a petition for rulemaking or a waiver request. In this regard, the Commission also note that there are no assurances that experimentation will lead to the establishment of an authorized service.

8. The Commission also adopt a requirement that Spectrum Horizons licensees submit an interim report on the progress of the experiment no later than five years from the date of grant. Given the expected wide variety of innovative experiments in the bands above 95 GHz, the Commission finds that interim reports will provide it with an awareness of ongoing technological developments as it contemplates rulemaking proposals and will enable the public to better assess innovative uses of the bands, thus encouraging further experimentation.

9. *Geographic Area.* Consistent with current practice for experimental licensing, Spectrum Horizons License applicants will be able to request operations over any area they deem appropriate for their experiment. Applicants have the burden of justifying their intended experimental operations, including the geographic area over which they intend to operate and any methods for avoiding causing harmful interference to other spectrum users. In turn, the Commission may impose limitations on the geographic extent of a license as necessary based

upon the specific parameters requested and other circumstances, including recommendations received via consultation with NTIA. The Commission finds that concerns are best addressed on a case-by-case basis and a blanket rule imposing geographic area restrictions for Spectrum Horizons Licenses do not warrant.

10. *Marketing.* Under the rules the Commission adopts, Spectrum Horizons licensees will permit to market experimental devices designed to operate in the bands above 95 GHz via direct sale. These rules diverge from the existing market trial rules which only permit devices to sell to other holders of experimental licenses or to lease devices to trial participants, by allowing direct sales to members of the general public. Additionally, the Commission will not limit the number of devices a licensee can market as part of the experiment. The Commission offers this added marketing flexibility because the characteristics of signals in the bands above 95 GHz effectively limit the range of each device to such an extent that a larger number of devices can operate without increasing the potential of harmful interference to authorized services.

11. The Commission adopts measures to ensure that licensees are able to exhibit control over their equipment. Specifically, the Commission will require licensees to ensure that trial devices are either rendered inoperable or retrieved at the conclusion of the trial. Additionally, each device sold under this program must be labeled as “Authorized Under An Experimental License and May be Subject to Further Conditions Including Termination of Operation” and carry with it a licensee-assigned equipment ID number. While the rules do not include a specific format for the identifying data, licensees who take advantage of these marketing provisions must uniquely identify each device (e.g., through a serial number) in a manner that will enable them to easily track each one. Finally, at the time of sale, the licensee is required to provide trial participants with a written disclosure that clearly states that the equipment being purchased is part of an experiment that may be terminated at any time by the licensee or the Commission, and the device will be surrendered or rendered inoperable at the conclusion of the experiment.

12. While the Commission acknowledged the concerns of some, such as Boeing and the National Radio Astronomy Observatory (NRAO) that the widespread marketing of experimental devices could lead to interference and other difficulties related to unauthorized devices, it believed that, when considered as a whole, the various requirements imposed on Spectrum Horizon licensees and its application review process would ensure the integrity of experimental operations above 95 GHz.

13. As with other experimental license applications, applicants for a Spectrum Horizons License will require to show how the experimental operations (and any related devices) will be controlled so that they do not cause harmful interference to other services. Further, as with all experimental licenses, Spectrum Horizons License operations will not be entitled to exclusive use; will not be protected from harmful interference from allocated services; and will be prohibited from causing harmful interference to stations of allocated services. In addition, the Commission has broad authority to place specific conditions on experimental licenses to minimize the risk of causing harmful interference to incumbent spectrum users. Similarly, NTIA's Interdepartment Radio Advisory Committee (IRAC) may recommend license conditions to the extent the frequencies in question are shared as part of a co-primary allocation for federal and non-federal use. The Commission will not impose specific requirements by rule on Spectrum Horizons licensees regarding how to control their experiment, but we do point out that the licensee remains responsible to ensure compliance with our rules.

### **Unlicensed Operations**

14. The Commission adopts rules designating 21.2 gigahertz of the Spectrum Horizons bands for unlicensed device use: the 116-123 GHz band, the 174.8-182 GHz band, the 185-190 GHz band, and the 244-246 GHz band. In keeping with the Commission's unlicensed device rules, devices using these bands will operate on a non-interference basis while protecting both passive and active services. The Commission asserted that these multiple bands of spectrum for unlicensed use should be sufficient to enable development of new unlicensed devices and

applications and it did not believe that providing additional frequency bands for unlicensed device operation above 95 GHz was necessary at this time. However, it did indicate a willingness to reassess the spectrum allocations based on how uses develop and revisit this issue at a later date.

15. *Coexistence Issues.* Several bands that contain or are adjacent to passive Earth exploration-satellite service and radio astronomy service allocations, acknowledging that these services require stringent protection levels.

16. *Radio Astronomy.* The Commission find that unlicensed devices can co-exist with radio astronomy in the same and adjacent spectrum bands above 95 GHz because of factors such as the high atmospheric losses associated with these frequency bands and the use of highly directional antennas. Most bands being made available for unlicensed devices are adjacent to radio astronomy allocations. The only frequency band in which unlicensed devices will be permitted to operate co-channel with radio astronomy is 244-246 GHz. As it noted above, the Commission pointed out that this band is also designated for use by ISM devices which are not subject to field strength limits within the band – unlicensed devices would operate at significantly lower power levels than ISM devices.

17. *Earth Exploration-Satellite Service.* As an initial matter, the Commission prohibits unlicensed devices above 95 GHz from operating on aircraft. To assess whether unlicensed devices can co-exist with the Earth exploration-satellite service, the Commission determined how many unlicensed devices would produce aggregate emissions that would exceed the harmful interference protection threshold, as set forth in ITU-R RS.2017, for the 174.8-182 GHz and 185-190 GHz bands. This analysis showed that up to 42,704 outdoor unlicensed devices can operate simultaneously at maximum power per square kilometer and still meet the protection levels for a vertical satellite scan of an Earth exploration satellite and 96.5 million unlicensed devices can operate simultaneously at maximum power per square kilometer for an angle scan without causing harmful interference. Based on these large device densities, the



Commission concluded that the potential for harmful interference to Earth exploration satellite operations is negligible. The same analysis is also applicable to the 116-122 GHz band but would result in an even lower likelihood of harmful interference because that band is subject to 20 dB higher atmospheric attenuation than the 174.8-182 GHz and 185-190 GHz bands.

18. To assess unlicensed device compatibility in bands adjacent to Earth exploration-satellite bands, the Commission's analysis shows that a nadir scan sensor can coexist with up to 3.38 billion simultaneously operating unlicensed devices per square kilometer in each of the 174.8-182 GHz and 185-190 GHz bands without causing harmful interference to EESS operations in the 182-185 GHz band. Similarly, for limb sounder sensing, the Commission's analysis shows that up to  $2.42 \times 10^{16}$  unlicensed devices can simultaneously operate per square kilometer without causing harmful interference to EESS operations in 182-185 GHz band. The Commission does not expect unlicensed devices in these bands to ever approach such densities and is confident that unlicensed operations at the adopted power levels adopted can successfully coexist with the passive services.

19. *Space Research Service.* This passive service has no receivers on Earth and those in space are aimed away from Earth into deep space. Hence, there are no interference concerns for this service in these bands. Further, there are no current or anticipated space research operations in the 174.8-182 GHz, and 185-190 GHz bands, so potential harmful interference from unlicensed operations in those bands is essentially irrelevant to SRS, despite the nominal SRS allocation there.

20. *Amateur Radio.* Amateur services have a secondary allocation in bands designated for ISM equipment, including, in this case, the 122.5-123 GHz band. ARRL states in its comments that radio amateurs already must plan for ISM emissions and those emissions generally have not caused harmful interference to amateur operations. The Commission believed the addition of unlicensed devices would be unlikely to have a marked impact on the noise

environment as compared to high-power ISM devices and declined to adopt any specific rules for unlicensed devices in the amateur radio allocations.

21. *Other allocations.* There are also a number of active service allocations in the bands the Commission identified for unlicensed use. Some, such as the fixed service, the mobile service, and the radiolocation and radionavigation services cannot be deployed because there are no service rules in place. Thus, for these cases, the Commission concluded that protection criteria need not be adopted at this time. The Commission also noted that the inter-satellite service also does not have service rules in place, but operations have been permitted on a case-by-case basis. Like the space research service, the inter-satellite service operates solely between satellites in space and therefore the Commission asserted that there is no significant risk of harmful interference from relatively low power unlicensed devices operating on the Earth, even if terrestrial operations were to occur in high volumes.

### **Technical Requirements**

22. The Commission adopts, with certain modifications, technical rules for unlicensed operations in the bands 116-123 GHz, 174.8-182 GHz, 185-190 GHz, and 244-246 GHz, under technical parameters similar to those for unlicensed operation in the 57-71 GHz band, consistent with the rules proposed in the NPRM. While a number of commenters supported unlicensed operation in these bands at the power levels proposed in the NPRM, the Commission did acknowledge several parties' concerns about the potential for unlicensed operation to cause interference. However, it ultimately concluded that unlicensed devices can operate in these frequency bands at the power levels proposed in the NPRM without causing harmful interference to services in these or adjacent bands.

23. As proposed in the NPRM, the new § 15.258 adopted by the Commission permits device operation in these bands with a maximum EIRP of 40 dBm (average) and 43 dBm (peak), measured with a detection bandwidth that encompasses the band of operation. The adopted rule also permits outdoor fixed point-to-point devices to operate with a higher maximum EIRP of 82

dBm (average) and 85 dBm (peak), also measured with a detection bandwidth that encompasses the band of operation. In order to operate under the higher power limits, devices must utilize antennas with a minimum gain of 51 dBi, with a 2 dB reduction in the maximum permissible EIRP for each dB the antenna gain falls below 51 dBi. The Commission determined that these highly directional antennas with very narrow beamwidths will ensure that the likelihood of harmful interference is minimized. The Commission will not at this time permit even higher power levels as suggested by IEEE 802, concluding that the adopted power levels will allow it to make additional spectrum available for new and innovative unlicensed devices while protecting other uses of the bands.

24. The Commission specified power limits for devices operating in these bands in terms of EIRP and did not specify a maximum conducted power limit. Devices operating in frequency bands above 95 GHz will likely not have a detachable antenna or port that could be used for measuring conducted power, making such measurements difficult. In addition, because the interference potential of a device is a function of its EIRP, rather than the transmitter conducted power, it is necessary to only specify EIRP limits. Further, because devices are unlikely to have interchangeable antennas, a conducted output power limit is not necessary to reduce the likelihood that a user could install a higher-gain antenna and substantially raise the EIRP, and interference potential, of a device. The Commission also required devices that operate with an emission bandwidth of less than 100 megahertz to reduce their maximum power to achieve a power spectral density no greater than that of a device operating with a bandwidth of 100 megahertz.

25. As proposed, the Commission adopts an out-of-band emission limit of 90 picowatts per square centimeter at a distance of three meters applicable at frequencies above 40 GHz, finding this emission limit sufficient to protect radio astronomy and other services operating in adjacent bands. While the Commission initially proposed specifying 200 GHz as the upper limit for measuring compliance with the out-of-band emission requirements, the Commission

recognizes the concerns of parties that note such a limit would be below the highest frequency band (244-246 GHz) being designated for unlicensed operation. In this regard, the Commission agreed with Underwriters Laboratory that out-of-band emissions measurements of unlicensed devices operating above 95 GHz should be required up to the third harmonic of the fundamental frequency of operation in order to ensure that at least one even order and one odd order harmonic are measured. The Commission also agreed with Underwriters Laboratory that it should specify an upper frequency limit for making measurements that corresponds to the upper frequency limit, e.g., 750 GHz, of standard waveguides used in making compliance measurements. Accordingly, the Commission will require unlicensed devices operating under new § 15.258 to comply with an out-of-band emission limit of 90 picowatts per square centimeter at a distance of three meters. Additionally, the Commission also amended § 15.33 to require measurements of out-of-band emissions from devices operating above 95 GHz at frequencies up to the third harmonic of the highest fundamental frequency or 750 GHz, whichever is lower. Finally, consistent with the requirements for most other part 15 intentional radiators, the Commission require devices to limit out-of-band radiated emissions at frequencies below 40 GHz to the limits specified in § 15.209(a).

26. The Commission also adopted other operational restrictions for devices in the 116-123 GHz, 174.8-182 GHz, 185-190 GHz, and 244-246 GHz bands that are similar to those for unlicensed devices in the 57-71 GHz band. Specifically, the Commission will not permit equipment to operate on satellites or onboard aircraft. This restriction, consistent with the requests of IEEE and CORF, will limit the potential for unlicensed devices to cause interference to radio astronomy and other passive services. Additionally, the Commission, recognizing that the 182-185 GHz band is a critical band for passive sensing and transmissions in the band are prohibited under footnote US 246, adopted the requirement that equipment operating in the 174.8-182 GHz and 185-190 GHz bands should not be designed to operate in the 182-185 GHz band. Additionally, because devices operating above 95 GHz are a new technology, the

Commission took a conservative approach in protecting radio services from harmful interference by not adopting the exemptions proposed in the NPRM that would have allowed operation onboard aircraft under certain conditions.

27. In the NPRM the Commission kept the door open on whether to broaden this proceeding to consider a proposal in a rulemaking petition filed by James Edwin Whedbee to allow unlicensed operations throughout the 95-1000 GHz range. With the exception of the petitioner himself, no other parties addressed this proposal. Given the apparent lack of interest and the Commission's decision to make 21.2 gigahertz of spectrum available for unlicensed use, the Commission was not persuaded that Whedbee's petition, to the extent it remains pending, warrants further consideration, and denied it.

#### **PROCEDURAL MATTERS**

28. *Final Regulatory Flexibility Analysis.* — As required by the Regulatory Flexibility Act of 1980 (RFA), as amended, the Commission has prepared a Final Regulatory Flexibility Analysis (FRFA) regarding the possible significant economic impact on small entities of the policies and rules adopted in this First Report and Order, which is found in Appendix B of the link provided in the beginning of this SUPPLEMENTARY INFORMATION section. The Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, will send a copy of the First Report and Order, including the FRFA, to the Chief Counsel for Advocacy of the Small Business Administration.

29. *Paperwork Reduction Act Analysis.* — This document contained new or modified information collection requirements. The Commission, as part of its continuing effort to reduce paperwork burdens, will invite the general public and the Office of Management and Budget (OMB) to comment on the information collection requirements contained in this document, as required by the Paperwork Reduction Act of 1995, Public Law 104-13. In addition, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4), the Commission previously sought, but did not receive specific comment on how we

might further reduce the information collection burden for small business concerns with fewer than 25 employees.

30. *Congressional Review Act.* — The Commission will send a copy of this First Report and Order to Congress and the Government Accountability Office pursuant to the Congressional Review Act, *see* 5 U.S.C. 801(a)(1)(A).

### **Ordering Clauses**

31. IT IS ORDERED that pursuant to sections 4(i), 7(a), 301, 302, 303, 307, and 310 of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 157(a), 301, 302a, 303, 307, 310, this Report and Order IS ADOPTED.

32. IT IS FURTHER ORDERED that the rules and requirements adopted herein WILL BECOME EFFECTIVE 30 days from the date of publication in the Federal Register with the exception of the modifications of §§ 5.59, 5.77, 5.121, 5.702, 5.703, 5.704, 5.705 and 15.258 of the rules which contain new or modified information collection requirements that require review by the OMB under the PRA, which WILL BECOME EFFECTIVE after OMB review and approval, on the effective date specified in a document that the Commission will publish in the Federal Register announcing such approval and effective date.

33. IT IS FURTHER ORDERED, pursuant to section 4(i) of the Communications Act of 1934, 47 U.S.C. 154(i), and § 1.407 of the Commission's Rules, that the Petition for Rulemaking of James Edwin Whedbee filed on November 5, 2013 is DENIED as described herein and Docket RM-11795 IS TERMINATED.

34. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this First Report and Order, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration and to Congress and the Government Accountability Office pursuant to the Congressional Review Act, *see* 5 U.S.C. 801(a)(1)(A).

List of Subjects

47 CFR Part 2

Radio, Reporting and recordkeeping requirements, Telecommunications.

47 CFR Part 5

Radio, Reporting and recordkeeping requirements.

47 CFR Part 15

Communications equipment, Radio.

FEDERAL COMMUNICATIONS COMMISSION

Marlene Dortch,  
Secretary.

## Final Rules

For the reasons discussed in the preamble, the Federal Communications Commission amends 47 parts 2, 5, and 15 as follows:

### **PART 2 – FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS**

1. The authority citation for part 2 continues to read as follows:

**Authority:** 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

2. Amend §2.803 by revising paragraph (c)(1) to read as follows:

#### **§ 2.803 Marketing of radio frequency devices prior to equipment authorization.**

\* \* \* \* \*

(c) \* \* \*

(1) Activities conducted under market trials pursuant to subpart H of part 5 of this chapter or in accordance with a Spectrum Horizons experimental radio license issued pursuant to subpart I of part 5.

\* \* \* \* \*

3. Amend § 2.1091 by revising paragraph (c)(2) to read as follows:

#### **§ 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.**

\* \* \* \* \*

(c) \* \* \*

(2) Unlicensed personal communications service devices, unlicensed millimeter-wave devices, and unlicensed NII devices authorized under §§15.255(g), 15.257(g), 15.258, 15.319(i), and 15.407(f) of this chapter are also subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if their ERP is 3 watts or more or if they meet the



definition of a portable device as specified in §2.1093(b) requiring evaluation under the provisions of that section.

\* \* \* \* \*

4. Amend § 2.1093 by revising paragraph (c)(1) to read as follows

**§ 2.1093 Radiofrequency radiation exposure evaluation: portable devices.**

\* \* \* \* \*

(c) \* \* \*

(1) Portable devices that operate in the Cellular Radiotelephone Service pursuant to part 22 of this chapter; the Personal Communications Service (PCS) pursuant to part 24 of this chapter; the Satellite Communications Services pursuant to part 25 of this chapter; the Miscellaneous Wireless Communications Services pursuant to part 27 of this chapter; the Upper Microwave Flexible Use Service pursuant to part 30 of this chapter; the Maritime Services (ship earth station devices only) pursuant to part 80 of this chapter; the Specialized Mobile Radio Service, the 4.9 GHz Band Service, and the 3650 MHz Wireless Broadband Service pursuant to part 90 of this chapter; the Wireless Medical Telemetry Service (WMTS), the Medical Device Radiocommunication Service (MedRadio), and the 76-81 GHz Band Radar Service pursuant to subparts H, I, and M of part 95 of this chapter, respectively; unlicensed personal communication service, unlicensed NII devices and millimeter-wave devices authorized under §§15.255(g), 15.257(g), 15.258, 15.319(i), and 15.407(f) of this chapter; and the Citizens Broadband Radio Service pursuant to part 96 of this chapter; are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use.

\* \* \* \* \*

**PART 5 – EXPERIMENTAL RADIO SERVICE**

5. The authority citation for part 5 continues to read as follows:

**Authority:** 47 U.S.C. 154, 301, 302, 303, 307, 336.

6. Amend § 5.3 by revising paragraph (l) and adding paragraph (m) to read as follows:

**§ 5.3 Scope of service.**

\* \* \* \* \*

(l) Marketing of equipment designed to operate only on frequencies above 95 GHz.

(m) Types of experiments that are not specifically covered under paragraphs (a) through (l) of this section will be considered upon demonstration of need for such additional types of experiments.

7. Amend § 5.54 by redesignating paragraph (f) as paragraph (g) and adding a new paragraph (f) to read as follows:

**§ 5.54 Types of authorizations available.**

\* \* \* \* \*

(f) *Spectrum Horizons experimental radio license.* This type of license is issued for the purpose of testing and marketing devices on frequencies above 95 GHz, where there are no existing service rules.

\* \* \* \* \*

8. Amend § 5.55 by revising paragraphs (c) and (d) to read as follows:

**§ 5.55 Filing of applications.**

\* \* \* \* \*

(c) Each application for station authorization shall be specific and complete with regard to the information required by the application form and this part.

(1) Conventional and Spectrum Horizons license and STA applications shall be specific as to station location, proposed equipment, power, antenna height, and operating frequencies.

(2) Broadcast license applicants shall comply with the requirements in subpart D of this part; Program license applicants shall comply with the requirements in subpart E of this part; Medical Testing license applicants shall comply with the requirements in subpart F of this part;

Compliance Testing license applicants shall comply with the requirements in subpart G of this part; and Spectrum Horizons license applicants shall comply with the requirements in subpart I of this part.

(d) Filing conventional, program, medical, compliance testing, and Spectrum Horizons experimental radio license applications:

(1) Applications for radio station authorization shall be submitted electronically through the Office of Engineering and Technology Web site *http://www.fcc.gov/els*.

(2) Applications for special temporary authorization shall be filed in accordance with the procedures of §5.61.

(3) Any correspondence relating thereto that cannot be submitted electronically shall instead be submitted to the Commission's Office of Engineering and Technology, Washington, DC 20554.

\* \* \* \* \*

9. Amend § 5.59 by revising the heading of paragraph (a) to read as follows:

**§ 5.59 Forms to be used.**

(a) *Application for conventional, program, medical, compliance testing, and Spectrum Horizons experimental radio licenses*--\* \* \*

\* \* \* \* \*

10. Amend § 5.71 by adding paragraph (d) to read as follows:

**§ 5.71 License period.**

\* \* \* \* \*

(d) *Spectrum Horizons experimental radio license*. Licenses are issued for a term of 10 years and may not be renewed.

11. Amend § 5.77 by revising paragraphs (a) introductory text and (b) to read as follows

**§ 5.77 Change in equipment and emission characteristics.**

(a) The licensee of a conventional, broadcast, or Spectrum Horizons experimental radio station may make any changes in equipment that are deemed desirable or necessary provided:

\* \* \* \* \*

(b) For conventional or Spectrum Horizons experimental radio stations, the changes permitted in paragraph (a) of this section may be made without prior authorization from the Commission provided that the licensee supplements its application file with a description of such change. If the licensee wants these emission changes to become a permanent part of the license, an application for modification must be filed.

\* \* \* \* \*

12. Amend § 5.79 by revising the section heading and paragraph (a) to read as follows:

**§ 5.79 Transfer and assignment of station authorization for conventional, program, medical testing, Spectrum Horizons, and compliance testing experimental radio licenses.**

(a) A station authorization for a conventional experimental radio license or Spectrum Horizons experimental radio license, the frequencies authorized to be used by the grantee of such authorization, and the rights therein granted by such authorization shall not be transferred, assigned, or in any manner either voluntarily or involuntarily disposed of, unless the Commission decides that such a transfer is in the public interest and gives its consent in writing.

\* \* \* \* \*

13. Amend § 5.107 by adding paragraph (f) to read as follows:

**§ 5.107 Transmitter control requirements.**

\* \* \* \* \*

(f) *Spectrum Horizons experimental radio licenses.* The licensee shall ensure that transmissions are in conformance with the requirements in subpart I of this part and that the station is operated only by persons duly authorized by the licensee

14. Amend § 5.121 by revising paragraph (a) to read as follows:

**§ 5.121 Station record requirements.**

(a)(1) For conventional, program, medical testing, compliance testing experimental radio stations, the current original authorization or a clearly legible photocopy for each station shall be retained as a permanent part of the station records but need not be posted. Station records are required to be kept for a period of at least one year after license expiration.

(2) For Spectrum Horizons experimental radio stations, the licensee is solely responsible for retaining the current authorization as a permanent part of the station records but need not be posted. Station records are required to be kept for a period of at least one year after license expiration.

\* \* \* \* \*

15. Add subpart I to read as follows:

**Subpart I—Spectrum Horizons Experimental Radio Licenses**

**Sec.**

**5.701 Applicable rules in this part.**

**5.702 Licensing requirement - necessary showing.**

**5.703 Responsible party.**

**5.704 Marketing of devices under Spectrum Horizons experimental radio licenses.**

**5.705 Interim report.**

**§ 5.701 Applicable rules in this part.**

In addition to the rules in this subpart, Spectrum Horizons experimental radio station applicants and licensees shall follow the rules in subparts B and C of this part. In case of any conflict between the rules set forth in this subpart and the rules set forth in subparts B and C of this part, the rules in this subpart shall govern.

**§ 5.702 Licensing requirement – necessary showing.**

Each application must include a narrative statement describing in detail how its experiment could lead to the development of innovative devices and/or services on frequencies above 95 GHz and describe, as applicable, its plans for marketing such devices. This statement must sufficiently explain the proposed new technology/potential new service and incorporate an interference analysis that explains how the proposed experiment would not cause harmful interference to other services. The statement should include technical details, including the requested frequency band(s), maximum power, emission designators, area(s) of operation, and type(s) of device(s) to be used.

**§ 5.703 Responsible party.**

(a) Each Spectrum Horizons experimental radio applicant must identify a single point of contact responsible for all experiments conducted under the license and ensuring compliance with all applicable FCC rules.

(b) The responsible individual will serve as the initial point of contact for all matters involving interference resolution and must have the authority to discontinue any and all experiments being conducted under the license, if necessary.

(c) The license application must include the name of the responsible individual and contact information at which the person can be reached at any time of the day; this information will be listed on the license. Licensees are required to keep this information current.

**§ 5.704 Marketing of devices under Spectrum Horizons experimental radio licenses.**

Unless otherwise stated in the instrument of authorization, devices operating in accordance with a Spectrum Horizons experimental radio license may be marketed subject to the following conditions:

(a) Marketing of devices (as defined in §2.803 of this chapter) and provision of services for hire is permitted before the radio frequency device has been authorized by the Commission.

(b) Licensees are required to ensure that experimental devices are either rendered inoperable or retrieved by them from trial participants at the conclusion of the trial. Licensees are required to

notify experiment participants in advance of the trial that operation of the experimental device is subject to this condition. Each device sold under this program must be labeled as “Authorized Under An Experimental License and May be Subject to Further Conditions Including Termination of Operation” and carry a licensee assigned equipment ID number.

(c) The size and scope of operations under a Spectrum Horizons experimental license are subject to limitations as the Commission shall establish on a case-by-case basis.

**§ 5.705 Interim report.**

Licensee must submit to the Commission an interim progress report 5 years after grant of its license. If a licensee requests non-disclosure of proprietary information, requests shall follow the procedures for submission set forth in §0.459 of this chapter.

**PART 15 – RADIO FREQUENCY DEVICES**

16. The authority citation for part 15 continues to read as follows:

**Authority:** 47 U.S.C. 154, 302a, 303, 304, 307, 336, 544a, and 549.

17. Amend § 15.33 by revising paragraph (a)(4) and adding paragraph (a)(5) to read as follows:

**§15.33 Frequency range of radiated measurements.**

\* \* \* \* \*

(a) \* \* \*

(4) If the intentional radiator operates at or above 95 GHz: to the third harmonic of the highest fundamental frequency or to 750 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

(5) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (4) of this

section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

\* \* \* \* \*

18. Amend § 15.205 by revising paragraph (d)(4) to read as follows:

**§ 15.205 Restricted bands of operation.**

\* \* \* \* \*

(d) \* \* \*

(4) Any equipment operated under the provisions of §§ 15.255 and 15.256 in the frequency band 75-85 GHz, § 15.257 in the 92-95 GHz band or § 15.258.

\* \* \* \* \*

19. Add § 15.258 to read as follows:

**§ 15.258 Operation in the bands 116-123 GHz, 174.8-182 GHz, 185-190 GHz and 244-246 GHz.**

(a) Operation on board an aircraft or a satellite is prohibited.

(b) Emission levels within the 116-123 GHz, 174.8-182 GHz, 185-190 GHz and 244-246 GHz bands shall not exceed the following equivalent isotropically radiated power (EIRP) limits as measured during the transmit interval:

(1) The average power of any emission shall not exceed 40 dBm and the peak power of any emission shall not exceed 43 dBm; or

(2) For fixed point-to-point transmitters located outdoors, the average power of any emission shall not exceed 82 dBm and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power of any emission shall not exceed 85 dBm and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The provisions in this paragraph (b)(2) for reducing transmit power based on antenna gain shall not require that the power levels be reduced below the limits specified in paragraph (b)(1) of this section.



(3) The peak power shall be measured with a detection bandwidth that encompasses the entire occupied bandwidth within the intended band of operation, e.g., 116-123 GHz, 174.8-182 GHz, 185-190 GHz or 244-246 GHz. The average emission levels shall be measured over the actual time period during which transmission occurs.

(4) Transmitters with an emission bandwidth of less than 100 MHz must limit their peak radiated power to the product of the maximum permissible radiated power (in milliwatts) times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph (b)(4), emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g., for frequency hopping devices).

(c) Spurious emissions shall be limited as follows:

(1) The power density of any emissions outside the band of operation, e.g., 116-123 GHz, 174.8-182 GHz, 185-190 GHz or 244-246 GHz, shall consist solely of spurious emissions.

(2) Radiated emissions below 40 GHz shall not exceed the general limits in § 15.209.

(3) Between 40 GHz and the highest frequency specified in § 15.33, the level of these emissions shall not exceed 90 pW/cm<sup>2</sup> at a distance of 3 meters.

(4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

(d) Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to + 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

(e) Regardless of the power density levels permitted under this section, devices operating under the provisions of this section are subject to the radiofrequency radiation exposure requirements

specified in §§1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

(f) Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

(g) Measurement procedures that have been found to be acceptable to the Commission in accordance with §2.947 of this chapter may be used to demonstrate compliance.

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